

REMARKS/ARGUMENTS

In order to expedite prosecution of this application, the claims have been amended to refer only to methods and products having at least two different functional moieties imprinted per imprint site.

However, Applicants reserve the right to continue seeking protection of material no longer encompassed by the claims by way of further applications.

Claims 20, 21, 28 and 29 are rejected under 35 U.S.C. 12, second paragraph as indefinite with respect to the terms "the functional moiety" and "the thermally labile protecting group". However, these claims already use the plural forms "moieties" and "groups". Claim 21 refers to a process in which the at least two different functional moieties are imprinted per imprint site, and in which amine groups are among the imprinted moieties. Claim 28 is a parallel claim referring to thiol or sulfhydryl groups. Claims 21 and 29 refer to specific labile protecting groups.

Withdrawal of this rejection is respectfully requested.

As stated above, the claims in this application have been amended to refer to processes and products in which there are at least two different imprinting moieties per imprint site. None of the cited references discloses such a situation and no combination of them makes it obvious. Applicants submit that the claims as amended are allowable and request a notice to that effect.

Claims 1-17, 20-22 and 43 are rejected as obvious over Katz and Davis in view of Ki et al.

With respect to the process claims herein, Katz and Davis disclose chemical, not thermal, deprotection. The Katz technique is discussed in the specification on pages 2-4, paragraphs 4 and 5, and is not the technique claimed herein.

As specifically stated in Katz, p. 286, left-hand column, the imprinting was done with molecules comprising benzene rings substituted by one, two and three protected 3-aminopropyltriethoxysilane groups. Deprotection was accomplished chemically by cleavage of

C-N bonds by reaction with trimethylsilyl iodide. The resulting trimethylsilyl carbonate was exposed to water and methanol to liberate the imprinted propylamine sites.

All of this involves imprinting with a chemically removable protecting group, not a thermally labile group, and deprotecting using chemical, not thermal, means. Thermal deprotection, or thermolysis, as in the inventive processes, involves removal of the protecting group by heat or other non-chemical means, and is a unimolecular process (only a single molecule - the imprinting agent - is involved). The chemical deprotection process of Katz is a bimolecular process, involving two molecules - the imprinting molecule and trimethylsilyl iodide. The two processes are thus radically different. The fact that a higher temperature was used for deprotection in Katz when the imprinting molecule had three, as opposed to one, imprinting groups, simply means that more driving force was necessary to carry out that deprotection step as opposed to the others, and not that it was a thermal deprotection. However, as discussed below, notwithstanding the increased temperature used with the trisubstituted imprinting molecule the results produced were significantly poorer than with molecules having one and two imprinting groups of the same type.

Katz itself states that even with increased temperature it was much more difficult to remove three imprinting groups than one. As stated in the left-hand column of page 287, with one or two imprinting groups in the molecule, imprint removal (chemically) was 73%, but with three such groups the removal was only 22%, even with a temperature increase.

As stated in the specification, paragraph [0005], discussing the Katz publication, with the chemical deprotection already low for an imprinting agent having three functional groups, those skilled in the art would have expected deprotection of four such groups to be extremely unlikely to occur and therefore would not have sought to carry out deprotection of four groups with this technique at all.

Furthermore, Katz and Davis disclose only imprinting with a single type of functional moiety. The methods of preparation of the imprinting compounds can produce only imprinting compounds having a single type of moiety to be imprinted. There is nothing in that reference that would teach those skilled in the art to imprint a single site with two or more different moieties, or how to do it.

Respecting claims 34, 35, 40 and 42, each claim requires four imprinted moieties per imprint site and Katz discloses a maximum of three. The disclosure of Katz is limited to a single type of imprint molecule, and it can readily be seen that those skilled in the art would not seek to use a tetra-substituted molecule of this type in the Katz process, for the reasons mentioned above. From that reference, it also would not have been obvious to produce a product having four imprinted groups per imprint site as called for in claim 34 and claims dependent on it.

In addition, even if those skilled in the art were able to find the optimal temperature for such an unlikely process, that process would still be a chemical - and not thermal - deprotection.

Katz and Davis thus lack essential elements of the presently claimed invention. For that reason the examiner seeks to combine Katz and Davis with Ki et al.

Ki et al. is discussed in the specification of this Application at p. 11, paragraph 36. Ki et al. used an imprinting compound with only a single functional moiety whereas the process claims herein call for use of an imprinting compound having at least two different functional moieties at an imprint site. Ki et al. produce a silica having only a single imprinted moiety per imprinting site.

Ki et al. thus does not make up for the lack of disclosure in Katz and Davis of any means for producing an imprinted product with at least two different functional groups per imprint site or for producing a product having four functional groups per imprint site.

Claims 18, 19, 23-27, 30-33, 45-48 and 50-55 are rejected as obvious over Katz and Davis in view of Ki et al., further in view of Dai et al. II.

Katz and Ki et al. are discussed above. Neither contains any disclosure about imprinting with at least two different functional moieties per imprint site.

The examiner asserts that Dai II disclose the use of different imprinting groups, referring to column 9 line 27 - col. 10 line 8.

The examiner has continued to assert that Dai et al. disclose imprinting with two different functional groups. However, on this point the examiner is totally wrong.

The portion of Dai et al. cited by the examiner contains a list of ligands that can be incorporated into their products. Each ligand is listed as a separate item; there are no combinations of ligands mentioned and no indication that any should be used in combination. The objective of this reference is the production of sorbents specific for certain metallic ions. Katz and Dai et al. II both use imprint molecules containing only one type of functional group to be imprinted (internal hetero atoms of various Dai et al. II imprinting molecules are not functional groups and are not imprinted in the final products). Dai et al. at column 6 lines 49-64, make it clear that their process can produce a series of separate imprints using various sorbents for different metals, but does not produce any product having two or more different functional groups in the same imprint. All of the current claims, which require at least two different organized functional groups per imprint site, are not obvious over this combination of references.

Claims 34-42 and 44 are rejected over the above three references, further in view of Wulff. However, Wulff does not bridge the gap between the prior art and the current claims.

First of all, the examiner points to Scheme 1, D of Wulff as showing a molecular imprint with four moieties at the site. However, this item is not an imprinted molecule but a diagram of a naturally occurring enzyme. An objective of the Wulff publication is to show multiple imprints. However, none of these contain more than three imprinted groups per imprint site, which is a confirmation of the maximum three groups per site of Katz and Davis. In addition, there is no disclosure in Wulff of any imprint that contained two or more different groups per site, and no disclosure of thermal imprinting with labile protecting groups.

Wulff provides some interesting information but nothing significant to add to or to modify the teachings of the other cited art, insofar as the current claims are concerned.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

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PATENT

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